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ABSTRACT

This paper provides educators with a general perspective on computer literacy and an in-depth examination of the Computer Literacy Awareness Assessment conducted by the Minnesota Educational Computing Consortium (MECC). Addressing computer literacy as part of the ongoing use of computers in a classroom setting is identified as the most reasonable approach for introducing computer literacy to British Columbia. Computer literacy is then defined and discussed in terms of specific experiences or desired outcomes of literacy. The remainder of the paper discusses the development of the Minnesota Assessment, including purposes of the test and its structure. The test comprises three parts: (1) affective assessment--six scales of five items each; (2) cognitive test--53 true/false or multiple choice items; and (3) survey of background variables--37 items. The appendices include the validation of the test; administration and scoring norms; a priori cognitive sub-test; revised cognitive sub-tests; reliabilities, means and standard deviations for cognitive sub-tests; intercorrelations and percentile norms of cognitive sub-test and revised sub-test; affective scales; and Computer Literacy Questionnaire. (CHC)

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Province of British Columbia
Ministry of Education

DISCUSSION PAPER 06/80

DEVELOPING STANDARDS AND NORMS FOR COMPUTER LITERACY

Prepared by
A. E. Wright

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Score along line and detach

The following is a discussion paper which has evolved from the work presently being conducted by JEM Research on behalf of the Ministry of Education. Its purpose is to obtain reaction to the ideas presented.

We encourage you to complete, detach and mail this form to the JEM Research office, Discovery Park, Box 1700, Victoria, B.C. V8W 2Y2, attention Dr. A. E. Wright, Research Associate.

COMMENTS: _____

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(Appendix items are extracted from Sandman, S. and Ronald E. Anderson Technical Report and Users Manual for the Minnesota Computer Literacy and Awareness Assessment, Form 1: St. Paul, M.E.C.C. March, 1980).

INTRODUCTION

With the heightened degree of interest in British Columbia in the integration of microcomputers into the regular classroom curriculum, JEM RESEARCH has received a number of queries from teachers over the last few months concerning computer literacy, along with requests for more information on the questionnaire published in a previous paper (Computer Literacy in the Schools of B.C. - 10/79).

This Discussion Paper is designed to provide educators with a general perspective on computer literacy and an in-depth examination of the Computer Literacy Awareness Assessment conducted by the Minnesota Educational Computing Consortium, with the assistance of the National Science Foundation.

For convenience, the original test instrument is included (Appendix H).

NOTE: This paper utilizes material made available by the Minnesota Educational Computing Consortium.

BACKGROUND

The services of main-frame computers and mini-computers have been used in education in British Columbia for several years - largely in connection with computer courses or senior mathematics programmes. This approach has tended to reinforce the notion that computer expertise is the province of the mathematically minded to the exclusion of others. More recently, the availability of inexpensive microcomputers has allowed the introduction of computer assisted learning into lower grades and for a wider variety of purposes, but this has been on a somewhat sporadic, local basis.

Meanwhile, the general use of computers in society is growing at a rapid rate and school systems, in preparing students for adult life, can no longer afford to have two kinds of graduates divided on the basis of the "computer expert" and the "computer illiterate". The importance of computer literacy is reinforced by the fact that many school systems have school computer courses or curriculum resource projects well underway and students from these systems will likely have a number of advantages in future job markets.

The pilot field test of microcomputers in the schools, presently being prepared by the Ministry of Education and JEM Research, represents the first systematic large-scale introduction of hardware into the classrooms of British Columbia. While the purpose of this project is to provide teachers with an effective instructional resource, there is no doubt that a second purpose exists - the fostering of a sense of ease, knowledge and familiarity with computers. In other words, computer literacy. In fact, during the initial interviews which preceeded the project, a number of respondents cited computer literacty as the primary reason for introducing microcomputers into the schools.

There is no doubt that using a microcomputer as part of the everyday instructional process in a classroom will have some effect on student attitudes and beliefs about computers. There exists already, a range of sophistication even at the elementary level, where parents have discovered the micro-computer to be an affordable hobby. On the other hand, some children have yet to experience a computer game or a calculator.

Given that computer literacy at least deserves consideration as an important factor in education, three basic approaches may be followed.

1. the introduction of computer literacy as an area of study;

2. the evolution of a literate attitude 'by default' through the instructional use of computers;

3. an approach which addresses computer literacy as part of the ongoing use of computers in a classroom setting.

Except in special cases, a new area of study may not be acceptable, given already crowded schedules. On the other hand the growth of literacy 'by default' may be a false expectation. Use of microcomputers in the classroom may be confined to tape and diskette, in which case, issues such as privacy and security, or functions such as programming and memory, will not arise. Use of the microcomputer as a terminal which accesses data bases housed in main-frame computers, may provide more opportunity for literacy to develop, as would student participation in the writing of programmes.

The third option - to address the concept of computer literacy as part of the ongoing use of microcomputers in the classroom - seems to be the most reasonable approach for use in British Columbia. This approach carries with it the requirement that teachers understand what computer literacy means, that they have some idea of the present student literacy level and some means of evaluating any digression (either upwards or downwards) from that level.

Until quite recently, the knowledge for educators to take stock of computer literacy levels and to place any significance on casual observations was simply not available. Over the past few years however, the Minnesota Educational Computing Consortium, with financial assistance from the National Science Foundation, has conducted an indepth study and survey of attitudes, standards and requirements resulting in a computer literacy test for which norms are available.

The test (Computer Literacy Questionnaire), was included in an earlier discussion paper (10/79) before any information on its structure was available. Design information on the test is presented later in this paper.

DEFINITIONS

The National Council of Supervisors of Mathematics includes computer literacy as one of ten basic skill areas.

> An essential outcome of contemporary education is computer literacy. Every student should have firsthand experience with both the capabilities and the limitations of computers through contemporary applications. Although the study of computers is intrinsically valuable, educators should also develop an awareness of the advantages of computers both in interdisciplinary problem solving and as an instructional aid.
>
> It is important for all citizens to understand what computers can and cannot do. Students should be aware of the many uses of computers in society, such as their use in teaching/learning, financial transactions and information storage and retrieval. The 'mystique' surrounding computers is disturbing and can put persons with no understanding of computers at a disadvantage. The increasing use of computers by governments, industry and business demands an awareness of computer uses and limitations.*

Such statements, however, do not define the specific experiences or desired outcomes of literacy.

In Manitoba, for example, recommendations for a computer literacy course at the secondary level were first made in 1972, but the arguments continue as to what computer literacy actually does - or should entail. Generally, however, literacy tends to stress the social, vocational and educational implications of computers. Just how these implications are presented and to what extent they involve practical experience

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*MCTM NEWSLETTER, Dec. 1976

with computers, then becomes the issue.

A case in print is a course* with the following as its major components.

Introduction to the Computer
Impact and Effect on Society
Control of Computers and the Future
Computer Programming
Computer Usage
Related Hands - On Experience

Although the preface to the course emphasizes a shift away from the programming area, it begins with modifications to existing programmes and hands-on experience before getting to social issues. To many, the stress would undoubtedly appear to be on the technical and mechanistic aspects of computers, to the detriment of their sociological aspects - privacy, security, convenience, learning modes and problem solving.

However, the course is geared to persons with 'average knowledge and understanding' of computers and average knowledge is taken to mean familiarity with at least terminology and flowcharting. By the time potential students begin a study of the social issues, therefore, they may be said to have more than "average" knowledge.

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*Metcalfe, Brian. Computers in the Modern World (A Proposed Half-Course in Computer Literacy At the Grade 10 Level).

THE MINNESOTA ASSESSMENT

Given the relative youth of this particular area of educational research, it is not surprising that the researchers with the M.E.C.C. study into computer literacy found that different authors place priorities on different aspects of computing. For example, emphasis may be placed on knowledge and concepts related to hardware and programming, or at the other extreme, "awareness" of applications and issues. Given this diversity, the M.E.C.C. project elected to develop a conceptual framework to serve as the basis for literacy questionnaires and incorporate as large a range of views as possible. Thus, computer literacy, or awareness, was viewed in its very broadest sense.

Information on a wide range of courses was collected; course descriptions, course objectives, curriculum guides and evaluation instruments were reviewed. Over two thousand test items were used to develop a comprehensive survey of possible learning outcomes. In order to define the "domain" of computer literacy, the test items were analysed to produce a list of objectives which was circulated to representatives of industry, education and professional computer societies. A final revision to the list was made on the basis of feedback.

Objectives were assigned priorities and a set of "core objectives" was decided upon, which would actually be reflected in the measuring instrument. Items were selected according to these core objectives. The initial text was administered to 1,131 secondary students (M.E.C.C. Computer Literacy Field Study - Anderson, Klaussen, Johnson and Honey, 1979). When revised on the basis of this trial, the result was the Minnesota Computer Literacy and Awareness Assessment, Form 1. Objectives, items and correspondence between scale and objectives are shown in the appendices.

Purposes

The purposes of the test, in its final form, are decribed by the authors as follows.

> The Minnesota Computer Literacy and Awareness Assessment, Form 1 is designed to assess the attitudes and knowledge regarding computers of groups of senior high students. The instrument can be used to determine a current level of computer literacy as an aid in planning computer education programs, for example on a district-wide basis. The instrument can be administered to students beginning a course on computers to find out what areas need to be stressed. Or, it can be given on a pretest-posttest basis to determine what has been learned, what needs to be reviewed, and what instruction has and has not been effective. The instrument can also be used to compare different computer literacy programs.

It is to be stressed that the instrument was developed for group measurement, not for the assessment of individuals. Individual scores may therefore be subject to considerable error, so it is not advised that they be used to make decisions about individual students.

TEST STRUCTURE

The total of one hundred and twenty items on the test is divided into three parts - an effective assessment, a cognitive test and a survey of background variables.

Affective

Consisting of thirty items, the affective part of the test is made up of statements with which a student strongly disagrees, disagrees, is undecided, agrees or strongly agrees. This dimension of the test concerns attitudes and values *vis a vis* computers and determines realistic attitudes such as the absence of fear, anxiety or intimidation.

The 30 items were conceived in terms of six affective scales of five items each. Validation data, to be considered later, reduced the number of items in some of the scales. The resulting affective scales are described below.

1. Enjoyment (5 items). The degree to which a student enjoys computers or learning about computers.

2. Anxiety (5 items). The level of anxiety or stress that is associated with dealing with computers.

3. Efficacy (4 items). The extent to which a student feels confident about his or her ability to deal with computers.

4. Sex-typing (4 items). The tendency to see computers or computing as a male-domain.

5. Policy Concern (5 items). The extent to which a student perceived various issues such as privacy and security relative to computer information as a matter of public concern.

6. Educational Computer Support (3 items). The degree to which a student feels positive toward the integration of computers into the educational system.

Cognitive

All fifty three items in the cognitive test are either true/false or multiple-choice; all contain an "I don't know" option. The items reflect the five cognitive dimensions of computer literacy described below.

1. Hardware (H) (10 items). Knowing the meaning of basic terms, such as "hardware" itself, can be considered as a minimum, and some understanding of the major components of a computer system and their interdependent functions is often considered essential.

2. Software and Data Processing (S) (8 items). This includes knowledge of how data is processed by computers and the fact that computers are controlled by people who write instructions in a specific language. In addition, a realization that computers store both the instructions (program) and the data within the memory is often viewed as critical.

3. Applications (A) (15 items). Computers are used in every sector of the society: in work, in government, in people's homes, and in school. Students need to know not only when and where computers are being used, but also when a computer application is called for, and when it is not.

4. Impact (I) (13 items). This is different from the application of computers in that it deals with the effects of applying computers. Many issues are of concern here including privacy, crime, careers, and employment. It is important for students to develop a realization of both the positive and negative impact of computers.

5. Programming and Algorithms (P) (7 items). This includes the ability to follow, modify, correct and develop algorithms expressed both as a set of English language instructions and in the form of a computer program.

Background Survey

This part of the instrument consists of 37 items on background variables that might be related to a student's attitudes or knowledge concerning computers. All items have a multiple-choice format. The section was included to serve specific research purposes of the M.E.C.C. Computer Literacy Project and as such is not expected to be administered by others using the instrument.

Validation

The instrument was used as part of the Minnesota State Assessment Programme. Details of techniques used to validate the test are shown in Appendix A.

APPENDIX A

MINNESOTA COMPUTER LITERACY AND AWARENESS ASSESSMENT: VALIDATION

VALIDATION OF THE INSTRUMENT

The instrument was administered to a sample of eleventh graders from throughout Minnesota as part of the Minnesota State Assessment Program. A stratified random sample of one-third of all Minnesota public secondary schools was taken. Stratification was on the basis of community size. Then a systematic sample of one-eighth of the eleventh-grade classrooms in these schools was taken, and the instrument was administered to these classrooms. A total of 2,535 students from 73 schools filled out the instrument. The validation information below is based on the data collected from these students. The cognitive and affective sections of the instrument will be considered separately.

Affective Assessment

The alpha reliabilities of the affective scales are reasonably high for such short scales. The corrected item-to-scale correlations are generally rather high, showing, with the reliabilities, that the affective scales hold together well.

A factor analysis was performed on the scores from the 2,535 students on all 30 affective items. Used, were a principal-factor solution and an orthogonal varimax rotation. Five common factors were obtained, each of which could be identified with one of the attitude scales. The Enjoyment, Anxiety, and Policy Concern scales were reproduced exactly, with five items having high loadings on each of the associated factors. However, the Sex-typing factor had only four high-loading items, and the Educational Computer Support factor only three. This, along with consideration of item-to-scale correlations, led to a reduced number of items in the final

scales . The Efficacy scale did not come out as a distinct factor, but it was decided to include this in the final scales anyway, with one item of the original five omitted.

In general, the intercorrelations of the affective scales are rather low, suggesting that the scales are measuring distinct attitude constructs. An exception is the Efficacy scale, which is highly related to both Enjoyment and Anxiety. It is probably these relationships that prevented Efficacy from emerging as a distinct factor in the factor analysis.

Cognitive Test

The alpha reliabilities of the a priori sub-tests and the composite test cannot be considered high for objective sub-tests. The reliability of .89 for the composite test is much more satisfactory.

The corrected item-to-sub-test correlation gives the correlation of the item to the sub-test with the item removed. In general these correlations are not very high. Better are the corrected item-to-composite correlations, really corrected point-biserial correlations between the items and the whole cognitive test. This result together with the reliability information suggests that the composite test holds together better than do the individual sub-tests.

Other favourable characteristics of the composite test are the desirable range of percent correct for the individual items and the reasonably high discrimination indices. The discrimination index gives the difference between the percentage getting the item correct among the upper 27% on the entire cognitive test and the percentage getting the item correct among the lower 27%.

The intercorrelations of the a priori sub-tests are rather high and, considering the low reliabilities, might cause one to question the distinctness of what is being measured in the individual sub-tests.

The scores from the 2,535 students on all 53 items were factor analyzed using a principal-factor solution followed by an orthogonal varimax rotation. As an individual item score is either 0 or 1 (incorrect or correct), the correlation matrix that was factored is really a matrix of phi coefficients. The possibility thus arises of obtaining difficulty factors, factors composed of items related only in their similar difficulty levels. Here, six common factors emerged. Four of the factor loadings could be reasonably interpreted in terms of computer concepts, one was a difficulty factor, and one factor had an insufficient number of high-loading items to be meaningfully interpreted.

For three of the four interpreted factors, the interpretations were in terms of computer literacy assessed by the a priori sub-tests. Applications, Software and Data Processing, and Programming and Algorithms each came out as a factor, although the items with high loadings on these factors differed somewhat from the items included in the respective a priori sub-tests. Thus it was decided to form revised cognitive sub-tests from these high-loading items, the revised sub-tests having the benefit on an empirical grouping of items.

The remaining interpreted factor related to a computer construct not specifically built into the instrument. This is "computer mystique", the tendency to attribute to a computer capabilties that it does not have. The high-loading items on this factor were taken together to form a further revised cognitive sub-test.

Thus there are four revised cognitive sub-tests. Their names and the number of items in each are listed below:

1. Applications (11 items)

2. Computer Mystique (5 items)

3. Software and Data Processing (5 items)

4. Programming and Algorithms (4 items)

APPENDIX B

MINNESOTA COMPUTER LITERACY AND AWARENESS ASSESSMENT:

ADMINISTRATION/SCORING AND NORMS

Administration

The affective and cognitive sections of the instrument can be administred together to a group of students in about 30 minutes. However, there is no time limit, and students should be allowed to work until they have finished answering all the items.

Directions to the students are given on the first page of the instrument and before each of the sections. For each item students are to mark the letter of their desired response on a separate answer sheet. A five-alternative answer sheet is required to administer the affective and cognitive sections of the instrument.

Scoring and Norms

Affective Assessment. All but three of the affective items are scored 1 for strongly disagree, 2 for disagree, 3 for undecided, 4 for agree, and 5 for strongly agree. Three items are reverse scored: 5 for strongly disagree, 4 for disagree, 3 for undecided, 2 for agree and 1 for strongly agree. All the affective scales are scored as the sum of the item scores. In all cases a high scale score represents a high degree of the attitude construct referred to in the scale name.

In deriving scale scores, unanswered items can be assigned the mean response over all students in the norming sample who answered that item.

Cognitive Test. The items of the cognitive test are scored either right or wrong. Unanswered items are considered wrong as are items answered with the 'I don't know' option. The composite test and all sub-tests are scored as the number of correct answers.

Norms have been derived from the data of the 2,535 students of the Minnesota eleventh-grade sample.

The norms are intended for group comparison, not for making decisions about individuals. Naturally, caution needs to be exercised in comparing tenth or eleventh-grade groups with the Minnesota eleventh-grade norms.

APPENDIX C

THE A PRIORI COGNITIVE SUB-TESTS:

OBJECTIVES, TEST ITEMS AND ITEM CHARACTERISTICS

25

Appendix C

The A Priori Cognitive Subtests:

Objectives, Test Items, and Item Characteristics

1. Hardware (H)

A. Objectives

	Objective[a]	Item Number(s)
*H.1.1	Identify the five major components of a computer: input equipment, memory unit, control unit, arithmetic unit, output equipment.	68
*H.1.2	Identify the basic operation of a computer system. Input of data or information - processing of data or information - output of data or information.	69
*H.1.3	Distinguish between hardware and software.	67,71
*H.1.4	Identify how a person can access a computer; e.g., 1. via a keyboard terminal a. at site of computer b. at any distance via telephone lines 2. via punched or marked cards 3. via other magnetic media (tape, diskette)	47,50
*H.1.5	Recognize the rapid growth of computer hardware since the 1940's.	66
*H.2.1	Determine that the basic components function as an interconnected system under the control of a stored program developed by a person.	72
*H.2.2	Compare computer processing and storage capabilities to the human brain, listing some general similarities and differences.	42,52

B. Items[b]

42. Some computers know just about everything. a) true b) false c) I don't know

47. In order to use a computer you would have to be in the same building as the computer. a) true b) false c) I don't know

* Items related to core objectives are shown by an asterisk.

50. In order to use any computer you would have to use a telephone.
a) true b) false c) I don't know

52. Some computers have good and bad feelings like people. a) true
b) false c) I don't know

66. The decade of first extensive manufacturing of computers was:
a) 1860's b) 1890's c) 1920's d) 1950's e) I don't know

67. Computer software is a term describing: a) computer programs
b) electronic components encased in soft plastic or rubber
c) people who work with computers d) mechanical and electronic
parts of a computer system e) I don't know

68. In addition to input and output equipment, computers contain:
a) terminals, paper, transistors b) memory units, control units,
arithmetic units c) printers and typewriters d) telephones,
keyboards, television screens e) I don't know

69. A computer system is best described as: a) processing b) programming,
input, and output c) input and output d) input, processing, and
output e) I don't know

71. The physical parts of a computer are referred to as: a) programs
b) hardware c) software d) manuals e) I don't know

72. When in operation, a computer: a) follows a set of instructions
written by people b) thinks just like a person c) recalls answers
from memory d) translates data from digital to analog code
e) I don't know

C. Item Characteristics

Item	Correct Answer	Percent Correct	Discrimination Index	Correlation with Composite (Corrected)	Correlation with Subtest (Corrected)
42	b	41.0	44.7	.32	.30
47	b	80.8	38.7	.39	.27
50	b	73.0	36.8	.30	.25
52	b	66.4	49.7	.39	.35
66	d	53.8	52.5	.37	.28
67	a	7.9	17.8	.24	.26
68	b	47.9	36.7	.26	.23
69	d	43.6	42.1	.30	.23
71	b	35.9	46.5	.33	.33
72	a	53.9	51.3	.36	.26

2. Software and Data Processing (S)

A. Objectives

	Objective[a]	Item Number(s)
S.1.1	Identify the fact that we communicate with computers through a binary code.	
S.1.2	Identify the need for data to be organized if it is to be useful.	
S.1.3	Identify the fact that information is data which has been given meaning.	
S.1.4	Identify the fact that data is a coded mechanism for communication.	
S.1.5	Identify the fact that communication is the transmission of information via coded messages.	
*S.1.6	Identify the fact that data processing involves the transformation of data by means of a set of pre-defined rules.	76
*S.1.7	Recognize that a computer needs instructions to operate.	73
*S.1.8	Recognize that a computer gets instructions from a program written in a programming language.	62,63
*S.1.9	Recognize that a computer is capable of storing a program and data.	75,79
*S.1.10	Recognize that computers process data by searching, sorting, deleting, updating, summarizing, moving, etc.	78
*S.2.1	Select an appropriate attribute for ordering of data for a particular task.	81
S.2.2	Design an elementary data structure for a given application (that is, provide order for the data).	
S.2.3	Design an elementary coding system for a given application.	

B. Items[b]

62. In order to program a computer, a person: a) can use any English language words b) can use any English or foreign language words c) must use programming language numbers, not words d) must use the words from a programming language e) I don't know

63. A computer program is a: a) course on computers b) set of instructions to control the computer c) computer generated presentation d) piece of computer hardware e) I don't know

73. Computers cannot run without: a) blinking lights b) keyboards c) instructions d) all of the above e) I don't know

75. At any given moment, a computer's memory unit can store: a) programs b) data c) answers d) all of the above e) I don't know

76. Data processing is best described as: a) the collection of data b) producing reports c) manipulating data according to instructions d) using punched cards in a keypunch machine e) I don't know.

78. Computer processing of data may involve: a) searching b) summarizing c) deleting d) all of the above e) I don't know

79. The computer must have two types of information to solve a problem: a) the problem and the answer b) the name of the program and user number c) the data and the instructions d) the name of the program and your name e) I don't know

81. A newspaper publisher has the following information about subscribers stored in the computer. They are name, address and renewal data. How would you arrange the information to be most useful to the delivery person? a) ordered listing by address b) ordered listing by renewal dates c) alphabetical listing of streets d) ordered listing by zip code e) I don't know

C. Item Characteristics

Item	Correct Answer	Percent Correct	Discrimination Index	Correlation with Composite (Corrected)	Correlation with Subtest (Corrected)
62	d	48.9	53.2	.39	.32
63	b	71.2	52.9	.44	.37
73	c	66.7	55.3	.42	.34
75	d	76.3	30.4	.27	.28
76	c	44.1	53.2	.37	.32
78	d	66.9	37.1	.29	.30
79	c	63.9	55.0	.43	.45
81	a	36.0	40.6	.29	.23

3. Applications (A)

A. Objectives

	Objective[a]	Item Number(s)
*A.1.1	Recognize specific uses of computers in some of the following fields: a. medicine b. law enforcement c. education d. engineering e. business f. transportation g. military defense systems h. weather prediction i. recreation j. government k. the library l. creative arts	31,32,33,34,35
A.1.2	Identify the fact that there are many programming languages suitable for a particular application for business or science.	
*A.1.3	Recognize that the following activities are among the major types of applications of the computer: a. information storage and retrieval b. simulation and modelling c. process control - decision-making d. computation e. data processing	58,59
*A.1.4	Recognize that computers are generally good at information processing tasks that benefit from: a. speed b. accuracy c. repetitiveness	36,53
*A.1.5	Recognize that some limiting considerations for using computers are: a. cost b. software availability c. storage capacity	61
*A.1.6	Recognize the basic features of a computerized information system.	51,64
*A.2.1	Determine how computers can assist the consumer.	39
*A.2.2	Determine how computers can assist in a decision-making process.	37,38
A.2.3	Assess the feasibility of potential applications.	
A.2.4	Develop a new application.	

B. Items[b]

31. Police sometimes use computers to help identify stolen cars. a) true b) false c) I don't know

32. Most nurses give injections by computer. a) true b) false c) I don't know

33. Computers cannot be used to assist in teaching English grammar. a) true b) false c) I don't know

34. Computers are not really used very much yet except by scientists. a) true b) false c) I don't know

35. Government officials use computers to store and retrieve large amounts of information about citizens. a) true b) false c) I don't know

36. People often use computers to store large amounts of information they wish to use over and over again. a) true b) false c) I don't know

37. Computers help people make decisions by providing correct answers to any question. a) true b) false c) I don't know

38. Computers help people make decisions by telling them if their problem is important. a) true b) false c) I don't know

39. Computers have been used to make more information and products available to the consumer. a) true b) false c) I don't know

51. In order to use a computer a person must know how to program. a) true b) false c) I don't know

53. Computers are not good for tasks that require: a) speed b) accuracy c) intuition d) something to be done over and over again e) I don't know

58. A basic use of computers in libraries involves: a) information storage and retrieval b) simulation and modelling c) process control d) computation e) I don't know

59. A basic use for computers in the design of airplanes is: a) simulation and modelling b) process control c) making reservations d) keeping inventory e) I don't know

61. Which of the following is a limiting consideration for using computers? a) cost b) software availability c) storage capacity d) all of the above e) I don't know

64. Which is not a characteristic of most information systems? a) a large volume of information is stored and used b) the information is organized c) the basic purpose is to provide reports and summaries of the data d) they contain only alphabetic data e) I don't know

C. Item Characteristics

Item	Correct Answer	Percent Correct	Discrimination Index	Correlation with Composite (Corrected)	Correlation with Subtest (Corrected)
31	a	89.9	22.7	.30	.31
32	b	73.2	26.2	.21	.21
33	b	71.8	47.1	.39	.36
34	b	90.7	23.5	.32	.31
35	a	74.9	30.8	.25	.23
36	a	89.7	25.3	.34	.34
37	b	42.2	50.6	.35	.31
38	b	56.3	50.4	.36	.35
39	a	74.0	39.3	.34	.32
51	b	23.2	42.4	.36	.28
53	c	80.1	49.1	.47	.41
58	a	73.3	58.5	.50	.44
59	a	39.5	51.5	.38	.31
61	d	46.9	23.4	.16	.14
64	d	49.2	59.1	.41	.35

4. Impact (I)

A. Objectives

	Objective[a]	Item Number(s)
*I.1.1	Distinguish among the following careers: a. keypuncher/keyoperator b. computer operator c. computer programmer d. systems analyst e. computer scientist	55,56,57
*I.1.2	Recognize that computers are used to commit a wide variety of serious crimes but especially stealing money and stealing information.	40
*I.1.3	Recognize that identification codes (numbers) and passwords are a primary means for restricting use of computer systems, of computer programs, and of data files.	41
I.1.4	Recognize that procedures for detecting computer-based crimes are not well developed.	
*I.1.5	Identify some advantages or disadvantages of a data base containing personal information on a large number of people (e.g., the list might include value for research and potential for privacy invasion).	60
I.1.6	Recognize several regulatory procedures, e.g., privilege to review one's own file and restrictions on use of universal personal identifiers, which help to insure the integrity of personal data files.	
*I.1.7	Recognize that most "privacy problems" are characteristic of large information files whether or not they are computerized.	44
*I.1.8	Recognize that computerization both increases and decreases employment.	45
*I.1.9	Recognize that computerization both personalizes and impersonalizes procedures in fields such as education.	43
*I.1.10	Recognize that computerization can lead to both great independence and dependence upon one's tools.	49

*I.1.11	Recognize that while computers do not have the mental capacity that humans do, through techniques such as artificial intelligence, computers have been able to modify their own instruction set and do many of the information processing tasks that humans do.	48
*I.1.12	Recognize that alleged "computer mistakes" are usually mistakes made by people.	54
*I.2.1	Plan a strategy for tracing and correcting a computer related error such as a billing error.	
I.2.2	Explain how computers make public surveillance more feasible.	
*I.2.3	Recognize that even though a person does not go near a computer, he or she is affected indirectly because the society is different in many sectors as a consequence of computerization.	46
I.2.4	Explain how computers can be used to impact the distribution and use of economic and political power.	

B. Items[b]

40. Computers are used to commit crimes, especially stealing money and stealing or falsifying information. a) true b) false c) I don't know

41. Identification numbers and passwords are a primary means for restricting undesired access to computer files. a) true b) false c) I don't know

43. Use of computers in education always results in less personal treatment of students. a) true b) false c) I don't know

44. Privacy is an issue whenever there are files containing personal information about people. a) true b) false c) I don't know

45. The increased use of computers in our society both eliminates and creates jobs. a) true b) false c) I don't know

46. Almost all people in our society are affected in some way by computers. a) true b) false c) I don't know

48. Computers are able to think in every way just like people. a) true b) false c) I don't know

49. Using computers can free one to do more creative tasks, but this may lead to more dependence upon machines. a) true b) false c) I don't know

54. If your charge account bill has an error, it was probably caused by: a) breakdown of the computer b) mistakes made by people c) poor design of the computer d) general weaknesses of machines e) I don't know

55. The main duty of a computer programmer is to: a) operate a computer b) prepare instructions for a computer c) schedule jobs for a computer d) design computers e) I don't know

56. The computer related job closest to that of a typist is: a) computer operator b) keypunch operator c) systems analyst d) computer programmer e) I don't know

57. Which of the following persons is the most likely to be associated with the design of computers? a) keypunch operator b) computer operator c) computer programmer d) computer scientist e) I don't know

60. The most controversial use of large computer files is: a) government planning b) research c) checking on people d) administration of social programs e) I don't know

C. Item Characteristics

Item	Correct Answer	Percent Correct	Discrimination Index	Correlation with Composite (Corrected)	Correlation with Subtest (Corrected)
40	a	39.6	41.4	.28	.25
41	a	69.0	44.3	.36	.32
43	b	31.8	43.7	.32	.24
44	a	85.4	30.1	.34	.34
45	a	89.2	26.9	.36	.35
46	a	88.0	26.9	.34	.30
48	b	73.7	51.0	.43	.34
49	a	83.4	21.3	.25	.24
54	b	62.5	46.9	.35	.30
55	b	65.3	55.1	.43	.37
56	b	60.4	29.5	.21	.18
57	d	70.4	47.2	.39	.35
60	c	43.7	59.9	.42	.37

5. Programming and Algorithms (P)

A. Objectives

	Objective[a]	Item Number(s)
P.1.1	Recognize the definition of "algorithm."	
*P.1.2	Follow and give the correct output for a simple algorithm.	65,70,82
*P.1.3	Given a simple algorithm explain what it accomplishes (i.e., interpret and generalize).	74,80
*P.2.1	Modify a simple algorithm to accomplish a new but related task.	77,83
P.2.2	Detect logic errors in an algorithm.	
P.2.3	Correct errors in an improperly functioning algorithm.	
P.2.4	Develop an algorithm for solving a specific problem.	
P.2.5	Develop an algorithm which can be used to solve a set of similar problems.	

B. Items[b]

65. Choose the correct output for the computer program shown below:

```
10 LET C = 6
20 LET D = 8
30 LET E = C+D+2
40 PRINT E
50 END
```

Output a) 6 b) 14 c) 8 d) 16 e) I don't know

70. Choose the correct output for the computer program shown below:

```
10 LET A = 3
20 LET B = 4
30 LET C = A
40 LET B = C
50 LET A = B
60 PRINT A,B
70 END
```

Output a) 3 4 b) 4 3 c) 3 3 d) 4 4 e) I don't know

74. What is the main purpose of the following program:

```
10  INPUT A, B, C, D, E
20  LET S = A+B+C+D+E
30  LET M = S/5
40  PRINT S,M
50  END
```

a) store A, B, C, D, and E in the computer b) print the letters S and M c) print the sum and average of five numbers d) calculate large sums e) I don't know

77. This program instructs the computer to count by two.

```
10  LET M = 0
20  LET M = M+2
30  PRINT M
40  IF M<100 THEN 20
50  END
```

Which change will produce a program which can be used to count by A? (For example, A=3, 5, or 8.)

a)
```
5 READ A
7 DATA 3,5,8
```
b)
```
5 LET M = A
30 PRINT A
```
c)
```
5 INPUT A
20 LET M = M+A
```
d)
```
5 LET X = A
20 LET M = X+A
```

e) I don't know

80. When the following program is run, the user enters numbers for A and B. The computer will:

```
10  INPUT A, B
20  LET A = A+B
30  LET B = A-B
40  LET A = A-B
50  PRINT A,B
60  END
```

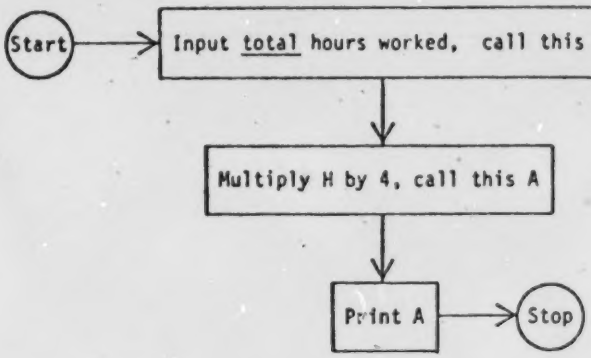
a) print the two input numbers, the smallest first b) print the two input numbers, the largest first c) print the two input numbers in reverse order from the way they were input d) print the two input numbers in the same order as they were input e) I don't know

82. Choose the correct output for the procedure described below:

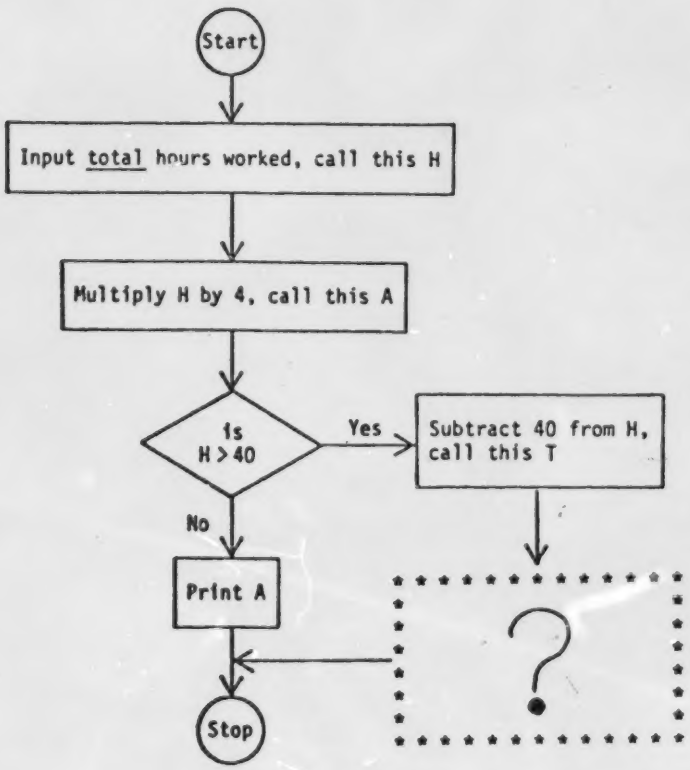
1. List the three names Brown, Anderson and Crane in alphabetical order.
2. Remove the last name from the list.
3. If only one name is left, stop. Otherwise, go on to step 4.
4. List the remaining names in reverse order.
5. Go back to step 2.

Output a) Anderson, Brown, Crane b) Brown c) Anderson, Brown d) Anderson e) I don't know

83. An algorithm (flowchart) to determine the weekly wages of employees in a bakery is shown below. Employees are paid $4 per hour up to 40 hours per week.



Employees are now to be paid "time-and-a-half" ($6 per hour) for overtime (hours worked over 40). How would you extend the flowchart below to include overtime pay? Select answer a, b, c, d, or e.



ANSWERS

a. Multiply T by 6, call this B
Print B

b. Multiply T by 6, call this B
Print A + B

c. Multiply T by 2, call this B
Print B

d. Multiply T by 2, call this B
Print A + B

e. I don't know

C. Item Characteristics

Item	Correct Answer	Percent Correct	Discrimination Index	Correlation with Composite (Corrected)	Correlation with Subtest (Corrected)
65	d	57.0	65.4	.48	.51
70	c	17.3	28.8	.25	.30
74	c	44.2	68.7	.49	.59
77	c	18.3	32.3	.29	.28
80	c	7.8	5.7	.07	.11
82	b	48.7	45.8	.31	.27
83	d	12.7	14.2	.14	.11

[a] Objectives marked with an asterisk (*) are designated as core objectives. (See text.)

[b] To save space, the item format here is somewhat condensed from that of the actual test.

APPENDIX D

THE REVISED COGNITIVE SUB-TESTS

Appendix D

The Revised Cognitive Subtests

1. Applications

Item	A Priori Subtest	Correlation with Revised Subtest (Corrected)	Item	A Priori Subtest	Correlation with Revised Subtest (Corrected)
31	A	.35	44	I	.35
33	A	.38	45	I	.36
34	A	.33	46	I	.38
35	A	.28	47	H	.38
36	A	.39	58	A	.41
39	A	.39			

2. Computer Mystique

Item	A Priori Subtest	Correlation with Revised Subtest (Corrected)	Item	A Priori Subtest	Correlation with Revised Subtest (Corrected)
37	A	.40	48	I	.49
38	A	.44	52	H	.46
42	H	.38			

3. Software and Data Processing

Item	A Priori Subtest	Correlation with Revised Subtest (Corrected)	Item	A Priori Subtest	Correlation with Revised Subtest (Corrected)
55	I	.40	73	S	.40
63	S	.42	79	S	.39
72	H	.35			

4. Programming and Algorithms

Item	A Priori Subtest	Correlation with Revised Subtest (Corrected)	Item	A Priori Subtest	Correlation with Revised Subtest (Corrected)
65	P	.60	74	P	.56
70	P	.28	82	P	.30

APPENDIX E

RELIABILITIES MEANS AND STANDARD DEVIATIONS FOR THE

COGNITIVE SUB-TESTS

Appendix E

Reliabilities, Means, and Standard Deviations for the Cognitive Subtests

I. A Priori Subtests and Composite Test

Subtest	No. of Items	Alpha Reliability	Mean No. Correct	Standard Deviation	Mean Percent Correct
Hardware	10	.59	5.04	2.12	50.4
Software	8	.62	4.74	1.98	59.2
Applications	15	.69	9.75	2.83	65.0
Impact	13	.67	8.62	2.54	66.3
Programming	7	.57	2.06	1.54	29.4
Composite	53	.89	30.21	8.91	57.0

II. Revised Subtests

Subtest	No. of Items	Alpha Reliability	Mean No. Correct	Standard Deviation	Mean Percent Correct
Applications	11	.71	9.08	2.07	82.5
Mystique	5	.66	2.80	1.56	55.9
Software	5	.62	3.21	1.50	64.2
Programming	4	.60	1.67	1.27	41.8

APPENDIX F

INTERCORRELATIONS OF THE COGNITIVE SUB-TESTS / PERCENTILE NORMS OF THE COGNITIVE SUB-TESTS, COMPOSITE TEST AND REVISED SUB-TESTS

Appendix F

Intercorrelations of the Cognitive Subtests

I. A Priori Subtests

Subtest	1	2	3	4	5
1. Hardware	1.00				
2. Software	.53	1.00			
3. Applications	.62	.58	1.00		
4. Impact	.60	.58	.70	1.00	
5. Programming	.44	.48	.47	.47	1.00

II. Revised Subtests

Subtest	1	2	3	4
1. Applications	1.00			
2. Mystique	.38	1.00		
3. Software	.49	.39	1.00	
4. Programming	.38	.31	.44	1.00

Appendix F

Percentile Norms for the Cognitive Subtests

I. A Priori Subtests

Score	Hardware	Software	Applications	Impact	Programming
15			99		
14			95		
13			88	98	
12			77	92	
11			64	81	
10	99		50	67	
9	97		37	52	
8	91	97	26	37	
7	81	87	17	25	.
6	66	70	10	16	99
5	49	51	6	9	96
4	32	34	3	5	88
3	18	20	2	3	71
2	9	11	1	1	50
1	3	5	.	.	30
0	1	1	.	.	10

II. Composite Test

Score	Percentile Rank	Score	Percentile Rank	Score	Percentile Rank
53	.	35	68	17	8
52	.	34	64	16	7
51	.	33	59	15	6
50	.	32	55	14	4
49	.	31	51	13	3
48	99	30	46	12	3
47	98	29	42	11	2
46	97	28	38	10	2
45	96	27	34	9	1
44	95	26	31	8	.
43	94	25	27	7	.
42	92	24	24	6	.
41	90	23	21	5	.
40	87	22	18	4	.
39	83	21	15	3	.
38	80	20	13	2	.
37	76	19	11	1	.
36	72	18	10	0	.

III. Revised Subtests

Score	Applications	Mystique	Software	Programming
11	85			
10	58			
9	38			
8	25			
7	15			
6	9			
5	5	92	88	
4	3	73	63	96
3	2	52	41	81
2	1	32	23	58
1	.	17	11	35
0	.	5	3	12

APPENDIX G

THE AFFECTIVE SCALES

55

Appendix G

The Affective Scales - Attitudes and Values (V):

Objectives, Items, and Item Characteristics

A. Objectives

	Objective[a]	Affective Scale	Item Number(s)
*V.1	Does not feel fear, anxiety, or intimidation from computer experiences.	Anxiety	2,3,4,8,9
*V.2	Feels confident about his/her ability to use and control computers.	Efficacy	11,12,13,14
*V.3	Values efficient information processing provided that it does not neglect accuracy, the protection of individual rights, and social needs.	Policy Concern	21,22,23,24,25
*V.4	Values computerization of routine tasks so long as it frees people to engage in other activities and is not done as an end in itself.		
*V.5	Values increased communication and availability of information made possible through computer use provided that it does not violate personal rights to privacy and accuracy of personal data.		
V.6	Values economic benefits of computerization for a society.		
V.7	Enjoys and desires work or play with computers, especially computer assisted learning.	Enjoyment	1,5,6,7,10

Objective[a]	Affective Scale	Item Number(s)
V.8 Describes past experiences with computers with positive-affect words like fun, exciting, challenging, etc.		
V.9 Given an opportunity, spends some free time using a computer.		
	Sex-typing	16,18,19,20
	Educational Computer Support	26,27,28

B. Items[b,c]

Enjoyment

1. I would like to learn more about computers.
5. I would very much like to have my own computer.
6. I would like the idea of taking computer courses.
7. I enjoy (or think I would enjoy) using computers in my classes.
10. I enjoy (or think I would enjoy) working with computers.

Anxiety

2. Working with a computer would probably make me feel uneasy or tense.
3. I feel helpless around a computer.
4. Computers sometimes scare me.
8. Walking through a room filled with computers would make me feel uneasy.
9. I feel uneasy when I am with people who are talking about computers.

Efficacy

11. I feel confident about my ability to use computers.
*12. It is my guess that I am not the kind of person who works well with computers.

13. On the whole, I can cope with computers in my daily living.

14. I am able to work with computers as well as most others my age.

(15 - omitted item. Computers are gaining too much control over people's lives.)

Sex-typing

*16. In general, females can do just as well as males in computer careers.

18. Using computers is more for males than for females.

*19. Studying about computers is just as important for females as for males.

20. Men make better scientists and engineers than women do.

(17 - omitted item. More females than males have the ability to become computer specialists.)

Policy Concern

21. Falsifying information in computers is a serious crime.

22. Unauthorized access to personal information in computer files is a serious problem.

23. Organizations should not be allowed to create secret computer files containing detailed information regarding people's personal lives.

24. Because of computerized information files, too many people have information about other people.

25. To protect people's privacy it is necessary to have laws regarding computer files that contain personal data.

Educational Computer Support

26. Every secondary school student should have some minimal understanding of computers.

27. Every secondary school student should be able to write a simple program.

28. Every secondary school student should learn about the role that computers play in our society.

(29 - omitted item. Computers can be a useful instructional aid in many subject areas other than mathematics.)

(30 - omitted item. Computers provide more disadvantages than advantages in education.)

C. Item Characteristics

Scale	Item[c]	Mean	Standard Deviation	Correlation with Scale (Corrected)
Enjoyment	1	3.72	0.88	.63
	5	3.28	1.14	.54
	6	3.46	1.00	.68
	7	3.74	0.93	.61
	10	3.68	0.91	.69
Anxiety	2	2.35	0.95	.51
	3	2.59	1.05	.50
	4	2.17	1.03	.47
	8	2.19	0.95	.56
	9	2.37	0.98	.46
Efficacy	11	3.02	1.01	.51
	*12	3.33	1.03	.47
	13	3.57	0.85	.43
	14	3.32	0.95	.44
Sex-typing	*16	1.74	0.90	.55
	18	2.05	0.99	.60
	*19	1.92	0.84	.52
	20	2.28	1.12	.51

Scale	Item[c]	Mean	Standard Deviation	Correlation with Scale (Corrected)
Policy Concern	21	3.74	0.96	.33
	22	3.87	0.85	.45
	23	3.93	1.04	.40
	24	3.43	0.89	.36
	25	4.02	0.82	.43
Educational Computer Support	26	3.83	0.84	.65
	27	3.43	0.91	.58
	28	3.83	0.81	.54

[a] Objectives marked with an asterisk (*) are designated as core objectives.

[b] Response alternatives for all items are strongly disagree, disagree, undecided, agree, and strongly agree.

[c] The three starred items are reverse-scored.

Substitute Responses for Unanswered Affective Items

Item	Response	Item	Response	Item	Response
1	4	11	3	21	4
2	2	12	3	22	4
3	3	13	4	23	4
4	2	14	3	24	3
5	3	15	3	25	4
6	3	16	4	26	4
7	4	17	2	27	3
8	2	18	2	28	4
9	2	19	4	29	4
10	4	20	2	30	2

Reliabilities, Means, and Standard Deviations for the Affective Scales

Scale	No. of Items	Alpha Reliability	Mean	Standard Deviation
Enjoyment	5	.83	17.88	3.77
Anxiety	5	.74	11.68	3.47
Efficacy	4	.68	13.23	2.75
Sex-typing	4	.74	7.98	2.91
Policy Concern	5	.64	18.99	2.93
Educational Computer Support	3	.76	11.09	2.10

Intercorrelations of the Affective Scales

Scale	1	2	3	4	5	6
1. Enjoyment	1.00					
2. Anxiety	-.41	1.00				
3. Efficacy	.58	-.53	1.00			
4. Sex-typing	-.18	.15	-.15	1.00		
5. Policy Concern	.07	.02	.03	-.21	1.00	
6. Educational Computer Support	.44	-.22	.33	-.28	.23	1.00

Percentile Norms for the Affective Scales

Score	Enjoyment	Anxiety	Efficacy	Sex-typing	Policy Concern	Educational Computer Support	Score
25	98	.			99		25
24	94	.			96		24
23	91	.			91		23
22	87	.			84		22
21	81	.			76		21
20	72	99	99	.	64		20
19	60	97	97	.	50		19
18	48	95	95	.	35		18
17	38	93	92	.	23		17
16	28	89	85	99	14		16
15	20	83	75	98	8	97	15
14	14	76	61	97	5	92	14
13	10	67	46	95	3	86	13
12	7	57	32	91	2	67	12
11	4	45	21	86	1	42	11
10	3	32	13	78	.	26	10
9	2	20	7	67	.	14	9
8	1	14	3	52	.	8	8
7	.	9	1	38	.	4	7
6	.	6	.	28	.	2	6
5	.	2	.	18	.	1	5
4			.	7		.	4
3						.	3

APPENDIX H

COMPUTER LITERACY QUESTIONNAIRE

COMPUTER LITERACY QUESTIONNAIRE

MINNESOTA EDUCATIONAL COMPUTING CONSORTIUM

2520 Broadway Drive

St. Paul, Mn. 55113

Supported by the National Science Foundation. Grant No. SED77-18658

Your Name (please print)_____

Dear Student:

We would appreciate your help by having you answer the questions in this booklet. There are two parts: the first part asks for your opinions and attitudes and the second part is a test of your knowledge about computers. Keep in mind that in the first part (the attitude questions) there are no right answers or wrong answers; just select the answer that best expresses how you feel. In the second part (the computer knowledge test) there may be items you have not yet learned. Just answer as many as you can. Keep in mind that the right answer is the best choice for each question.

Thank You.

This questionnaire developed by:

Ronald E. Anderson

David C. Johnson

Thomas P. Hansen

Daniel L. Klassen

PART 1

DIRECTIONS: Indicate how much you AGREE or DISAGREE with each of the following statements by circling the appropriate letter. Circle "a" if you STRONGLY DISAGREE with the statement. Circle "b" if you DISAGREE with the statement a little. Circle "c" if you are UNDECIDED about whether you agree or disagree with the statement. Circle "d" if you AGREE with the statement a little. Circle "e" if you STRONGLY AGREE with the statement.

As an example, if you AGREE a little that computers are noisy, then circle "d" as shown below:

Computers are noisy a b c (d) e

Or, if you are UNDECIDED about whether computers are noisy, circle "c" as shown below:

Computers are noisy a b (c) d e

If you have any questions, ask your teacher.

		STRONGLY DISAGREE a	DISAGREE b	UNDECIDED c	AGREE d	STRONGLY AGREE e
1.	I would like to learn more about computers..	a	b	c	d	e
2.	Working with a computer would probably make me feel uneasy or tense.....	a	b	c	d	e
3.	I feel helpless around a computer.....	a	b	c	d	e
4.	Computers sometimes scare me.....	a	b	c	d	e
5.	I would very much like to have my own computer.....	a	b	c	d	e
6.	I would like the idea of taking computer courses.....	a	b	c	d	e
7.	I enjoy using computers in my classes.....	a	b	c	d	e
8.	Walking through a room filled with computers would make me feel uneasy.....	a	b	c	d	e

		STRONGLY DISAGREE	DISAGREE	UNDECIDED	AGREE	STRONGLY AGREE
		a	b	c	d	e
9.	I feel uneasy when I am with people who are talking about computers.....	a	b	c	d	e
10.	I enjoy working with computers.....	a	b	c	d	e
11.	I feel confident about my ability to use computers.....	a	b	c	d	e
12.	It is my guess that I am <u>not</u> the kind of person who works well with computers.....	a	b	c	d	e
13.	On the whole, I can cope with computers in my daily living.....	a	b	c	d	e
14.	I am able to work with computers as well as most others my age.....	a	b	c	d	e
15.	Computers are gaining too much control over people's lives.....	a	b	c	d	e
16.	In general, females can do just as well as males in computer careers.....	a	b	c	d	e
17.	More females than males have the ability to become computer specialists.....	a	b	c	d	e
18.	Using computers is more for males than for females.....	a	b	c	d	e
19.	Studying about computers is just as important for females as for males.....	a	b	c	d	e
20.	Men make better scientists and engineers than women do.....	a	b	c	d	e
21.	Falsifying information in computers is a serious crime.....	a	b	c	d	e
22.	Access to personal information in computer files is a serious problem.....	a	b	c	d	e
23.	Organizations should <u>not</u> be allowed to create secret computer files containing detailed information regarding people's personal lives.....	a	b	c	d	e
24.	Because of computerized information files, too many people have information about other people.....	a	b	c	d	e

	STRONGLY DISAGREE a	DISAGREE b	UNDECIDED c	AGREE d	STRONGLY AGREE e
25. To protect people's privacy it is necessary to have laws regarding computer files that contain personal data.....	a	b	c	d	e
26. Every secondary school student should have some minimal understanding of computers.....	a	b	c	d	e
27. Every secondary school student should be able to write a simple program.....	a	b	c	d	e
28. Every secondary school student should learn about the role that computers play in our society.....	a	b	c	d	e
29. Computers can be a useful instructional aid in many subject areas other than mathematics.....	a	b	c	d	e
30. Computers provide more disadvantages than advantages in education.....	a	b	c	d	e

DIRECTIONS: Indicate whether you think each of the following values is UNIMPORTANT, IMPORTANT, or EXTREMELY IMPORTANT by circling the appropriate letter. Circle "a" if you think the value is UNIMPORTANT. Circle "b" if you think the value is IMPORTANT. Circle "c" if you think it is EXTREMELY IMPORTANT.

As an example, if you think saving money is EXTREMELY IMPORTANT, circle "c" as shown below:

Saving money a b (c)

	UNIMPORTANT a	IMPORTANT b	EXTREMELY IMPORTANT c
31. Freedom	a	b	c
32. World Peace.....	a	b	c
33. Economic Growth.....	a	b	c

	UNIMPORTANT a	IMPORTANT b	EXTREMELY IMPORTANT c
34. Scientific Knowledge.....	a	b	c
35. Privacy.....	a	b	c
36. Technological Advancement.....	a	b	c
37. Computerization.....	a	b	c
38. Efficiency.....	a	b	c
39. Love and Friendship.....	a	b	c
40. Self Respect.....	a	b	c

DIRECTIONS: Below are some adjectives that can be used to describe computers. For each adjective circle the alternative which best expresses how you feel about computers. If you aren't sure how you feel, circle "undecided."
As an example, if you feel that computers are very big, then circle as shown here:

a. not big b. big (c. very big) d. undecided

If you feel that computers are not big, then circle as shown here:

(a. not big) b. big c. very big d. undecided

Circle one alternative for each of the eight adjectives.

COMPUTERS ARE:

41. a. not personal b. personal c. very personal d. undecided
42. a. not frustrating b. frustrating c. very frustrating d. undecided
43. a. not good b. good c. very good d. undecided
44. a. not humanizing b. humanizing c. very humanizing d. undecided
45. a. not challenging b. challenging c. very challenging d. undecided
46. a. not bad b. bad c. very bad d. undecided
47. a. not impersonal b. impersonal c. very impersonal d. undecided
48. a. not dehumanizing b. dehumanizing c. very dehumanizing d. undecided

PART II

DIRECTIONS: For each of the following questions, circle the letter beside the best answer. If you do not know the answer to a question, do not leave the item blank; circle the letter beside "I don't know." Use the "I don't know" response as little as possible. Use the "I don't know" response only when you don't even have a guess about the best answer. Do NOT leave any item blank that you attempt; either circle the letter beside an answer or "I don't know."

1. Police sometimes use computers to help identify stolen cars.

   a. true
   b. false
   c. I don't know

2. Most hospitals give injections by computer.

   a. true
   b. false
   c. I don't know

3. Computers cannot be used to assist in teaching English grammar.

   a. true
   b. false
   c. I don't know

4. Computers are not really used very much yet except by scientists.

   a. true
   b. false
   c. I don't know

5. Government officials use computers to store and retrieve large amounts of information about citizens.

   a. true
   b. false
   c. I don't know

6. People often use computers to store large amounts of information they wish to use over and over again.

   a. true
   b. false
   c. I don't know

7. Computers help people make decisions by providing correct answers to any question.

   a. true
   b. false
   c. I don't know

8. Computers help people make decisions by telling them if their problem is important.

   a. true
   b. false
   c. I don't know

9. Computers have been used to make more information and products available to the consumer.

   a. true
   b. false
   c. I don't know

10. Computers are used to commit crimes, especially stealing money and stealing or falsifying information.

    a. true
    b. false
    c. I don't know

11. Identification numbers and passwords are a primary means for restricting undesired access to computer files.

    a. true
    b. false
    c. I don't know

12. Use of computers in education always results in less personal treatment of students.

    a. true
    b. false
    c. I don't know

13. Privacy is an issue with files containing personal information about people.

    a. true
    b. false
    c. I don't know

14. The increased use of computers in our society both eliminates and creates jobs.

    a. true
    b. false
    c. I don't know

15. Almost all people in our society are affected in some way by computers.

    a. true
    b. false
    c. I don't know

16. In order to use a computer you would have to be in the same building as the computer.

a. true
b. false
c. I don't know

17. Computers are able to think in every way just like people.

a. true
b. false
c. I don't know

18. Using computers can free one to do more creative tasks, but this may lead to more dependence upon machines.

a. true
b. false
c. I don't know

19. In order to use any computer you would have to use a telephone.

a. true
b. false
c. I don't know

20. In order to use a computer a person must know how to program.

a. true
b. false
c. I don't know

21. Computers are <u>not</u> good for tasks that require:

a. speed
b. accuracy
c. intuition
d. something to be done over and over again
e. I don't know

22. If your charge account bill has an error, it was probably caused by:

a. breakdown of the computer
b. mistakes made by people
c. poor design of the computer
d. general weaknesses of machines
e. I don't know

23. The main duty of a computer programmer is to:

a. operate a computer
b. prepare instructions for a computer
c. schedule jobs for a computer
d. design computers
e. I don't know

24. The computer related job closest to that of a typist is:

a. computer operator
b. keypunch operator
c. systems analyst
d. computer programmer
e. I don't know

25. Which of the following persons is the most likely to be associated with the design of computers?

a. keypunch operator
b. computer operator
c. computer programmer
d. computer scientist
e. I don't know

26. A basic use of computers in libraries involves:

a. information storage and retrieval
b. simulation and modelling
c. process control
d. computation
e. I don't know

27. A basic use for computers in the design of airplanes is:

a. simulation and modelling
b. process control
c. making reservations
d. keeping inventory
e. I don't know

28. The most questionable use of large computer files is:

a. government planning
b. research
c. checking on people
d. administration of social programs
e. I don't know

29. Which of the following is a limiting consideration for using computers?

a. cost
b. software availability
c. storage capacity
d. all of the above
e. I don't know

30. Which is <u>not</u> a characteristic of most information systems?

a. a large volume of information is stored and used
b. the information is organized
c. the basic purpose is to provide reports and summaries of the data
d. they contain only alphabetic data
e. I don't know

31. The decade of first extensive manufacturing of computers was:

a. 1860's
b. 1890's
c. 1920's
d. 1950's
e. I don't know

32. Computer software is a term describing:

a. computer programs
b. electronic components encased in soft plastic or rubber
c. people who work with computers
d. mechanical and electronic parts of a computer system
e. I don't know

33. In addition to input and output equipment, computers contain:

a. terminals, paper, transistors
b. memory units, control units, arithmetic units
c. printers and typewriters
d. telephones, keyboards, television screens
e. I don't know

34. A computer system is best described as:

a. processing
b. programming, input, and output
c. input and output
d. input, processing, and output
e. I don't know

35. The physical parts of a computer are referred to as:

a. programs
b. hardware
c. software
d. manuals
e. I don't know

36. When in operation, a computer:

a. follows a set of instructions written by people
b. thinks just like a person
c. recalls answers from memory
d. translates data from digital to analog code
e. I don't know

37. Computers cannot run without:

a. blinking lights
b. keyboards
c. instructions
d. all of the above
e. I don't know

38. In order to program a computer, a person:

a. can use any English language words
b. can use any English or foreign language words
c. must use programming language numbers, not words
d. must use the words from a programming language
e. I don't know

39. At any given moment, a computer's memory unit can store:

a. programs
b. data
c. answers
d. all of the above
e. I don't know

40. Data processing is best described as:

a. the collection of data
b. producing reports
c. manipulating data according to instructions
d. using punched cards in a keypunch machine
e. I don't know

41. A computer program is a:

a. course on computers
b. set of instructions to control the computer
c. computer generated presentation
d. piece of computer hardware
e. I don't know

42. Computer processing of data may involve:

a. searching
b. summarizing
c. deleting
d. all of the above
e. I don't know

43. The computer must have two types of information to solve a problem:

a. the problem and the answer
b. the name of the program and user number
c. the data and the instructions
d. the name of the program and your name
e. I don't know

44. A newspaper publisher has the following information about subscribers stored in the computer. They are name, address and renewal date. How would you arrange the information to be most useful to the delivery person?

a. ordered listing by address
b. ordered listing by renewal dates
c. alphabetical listing of streets
d. ordered listing by zip code
e. I don't know

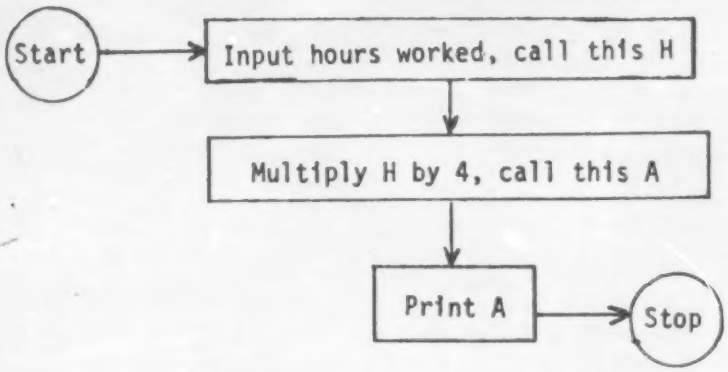
45. Choose the correct output for the procedure described below:

1. List the three names Brown, Anderson and Crane in alphabetical order
2. Remove the last name from the list
3. If only one name is left, stop. Otherwise, go on to step 4
4. List the remaining names in reverse order
5. Go back to step 2

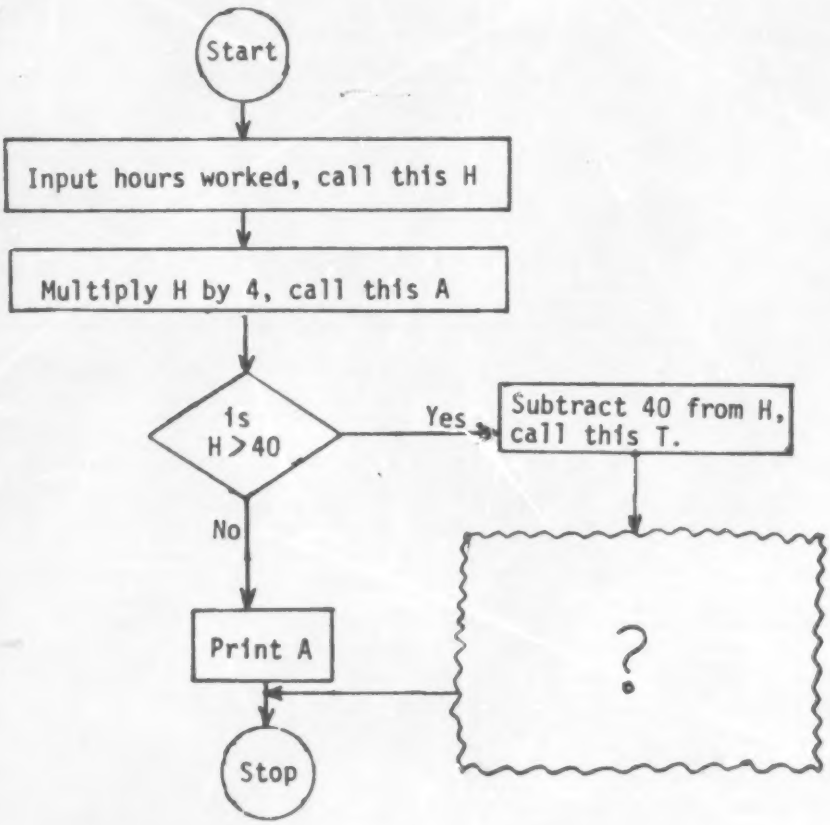
Output

a. Anderson, Brown, Crane
b. Brown
c. Anderson, Brown
d. Anderson
e. None of these

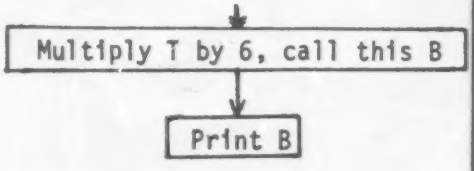
46. An algorithm (flowchart) to determine the weekly wages of employees in a bakery is shown below. Employees are paid $4 per hour up to 40 hours per week.



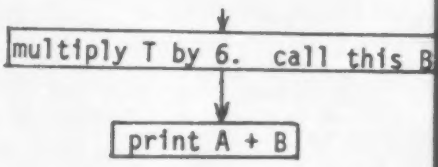
Employees are also paid "time-and-a-half" ($6 per hour) for overtime (hours worked over 40). How would you extend the flowchart below to include overtime pay. Select answer a, b, c, d, or e.



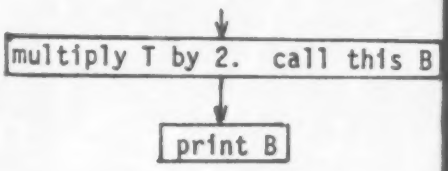
a.)



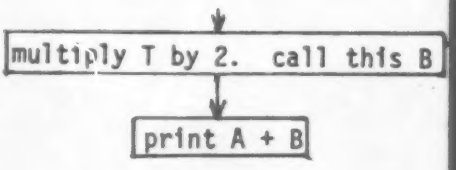
b.)



c.)



d.)



e.) I don't know

DIRECTIONS: If you have never written a computer program, STOP: do NOT answer items 1 - 3 below. Answer items 1 - 3 only if you have written a computer program before.

1. Choose the correct output for the computer program shown below:

```
1       LET A = 3
2       LET B = 4
3       LET C = A
4       LET B = C
5       LET A = B
6       PRINT A,B
7       END
```

Output

a. 3 4
b. 4 3
c. 3 3
d. 4 4
e. I don't know

2. When run on a computer, the following program will:

```
1       INPUT A, B, C, D, E
2       LET S = A+B+C+D+E
3       LET M = S/5
4       PRINT S,M
5       END
```

a. Calculate the sum of five input values
b. Calculate the average of five input values
c. Print the sum and average of five input values
d. all of the above
e. I don't know

3. This program instructs the computer to count by two.

```
10  LET M = 0
20  LET M = M + 2
30  PRINT M
40  IF M<100 THEN 20
50  END
```

Which change will produce a program which can be used to count by A? (For example, A=3, 5, or 8.)

a.
```
5 READ A
7 DATA 3,5,8
```

b.
```
5 LET M = A
30 PRINT A
```

c.
```
5 INPUT A
20 LET M = M + A
```

d.
```
5 LET X = A
20 LET M = X + A
```

e. I don't know